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CHALLENGES OF SCOPE DEFINITION FOR PROJECTS USING CONVENTIONAL CONSTRUCTION PROCUREMENT METHOD IN NIGERIA

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Abstract
Embarking on capital project development without elaborate scope definition often results in disruption of production flow leading to rework, extension of project duration and cost overrun, and lowers the morale and productivity of the workforce. The major challenge facing most building and infrastructural projects in Nigeria is the absence of clearly defined project scope prior to construction project implementation. This study aimed at assessing the challenges and constraints to effective project definition in the Nigerian construction industry. Descriptive research design was adopted. Data were gathered through a survey questionnaire from Fifty-two construction professionals working in public organisations using purposive sampling technique. The data collected were analysed using both descriptive and inferential statistics. The result of the study revealed that project design parameters, project requirements, site information, project execution plan and business strategy are the five most important activity group required in project definition. The result also indicates that the major challenges militating against effective project definition are lack of knowledge of project definition process, initial problem represented by client's information, insufficient time allocated to project definition, and information constraints among others. The practical implication of this study is that it highlights important activities that make a successful project scope definition and also major constraints faced by professionals during the scope development stage of projects.

Key words: Construction, procurement, project, scope, Nigeria.

BACKGROUND OF THE STUDY

A major challenge facing most building and infrastructural projects procured using the conventional procurement method in Nigeria is the absence of clearly defined project scope right from inception. Aibinu and Jagboro (2002) observed that the 5-10% of total contract sum often allowed as contingency to cover up for the lapses in effectively defining the project scope is grossly inadequate. This is because most building projects in Nigeria experienced significant cost and schedule overrun resulting from ineffective project scope definition and consequently lead to adversarial relationship between the client and the contractor.

Project scope definition is the process by which the clients' expectation of the final product is fully described by the design consultants at the conceptual stage of the project. If this step is skipped or inadequately developed, it will most likely lead to scope creep, which invariably will affect project planning. Critical analyses of the risks associated with the project are also examined at the conceptual stage of project development. These informed the choice of specific approach to project execution. Terms used in the construction industry that is synonymous with project scope definition include client briefing, pre-project planning, needs assessment, requirements processing, front-end planning, feasibility analysis, programming/schematic design, and conceptual planning. The process begins with early stage planning and design for physical facility projects requiring capital investment. The extent of efforts expended in defining project scope will determine the success of the detailed design, construction, and start-up phases of a project (Gibson *et al.*, 2006).

Poor scope definition is perceived by industry practitioners as one of the major causes of project management deficiencies, adversely affecting projects in the areas of cost, schedule, and operation (Cho and Gibson 2001). Song, and AbouRizk (2005) described project scope definition as the reference point for the development of project cost and schedules, coordinating teamwork, applying control strategies, and measuring project performance. The project scope definition process according to Gibson *et al*. (1995) can be summarized into four major steps: (1) organize for pre-project planning; (2); select project alternative(s); (3) detailed project scope definition and (4) decide whether to proceed with detailed design of the project.

Research results have shown that a 20% cost savings and a 39% schedule savings has been achieved with greater project scope definition efforts on industrial projects (Cho and Gibson 2001). Because of the advantages associated with improved project predictability, the study concluded that a complete scope definition prior to project execution is imperative to project success.

Earlier research by Construction Industry Institute (CII) led to the development of Project Definition Rating Index (PDRI), a useful tool for measuring the level of project definition at the time the project (industrial) is authorized for final funding. A similar research was embarked on in 1997 (Cho and Gibson 2001) which led to the development of the Project Definition Rating Index for Building Projects (PDRI-Buildings). The PDRI - Buildings which is very similar to PDRI- Industrial comprises a checklist of 64 scope definition items, which are grouped into 11 categories.

The authors' experience in several capital projects awarded in Nigeria between 2003 and 2011 where contracts are awarded and contractors mobilized to site while the project details are yet to be finalised suggest that this practice is the norm. The aim of the present study was to assess the challenges of project scope definition in the Nigeria building industry. The specific objectives of the study were to:

i examine stakeholders perception of importance of activities required in construction project definition
ii examine the challenges that project managers/construction professional face in effectively developing project definition

LITERATURE REVIEW

Project definition is the process of defining the project's purpose and the development of alternative means to satisfy it. The definition phase involves knowing what is wanted (project purpose) and having an outline of what options are available, the risks involved to a clear specification of what will be required to achieve the project goal such that a confident estimate can be made about the time, cost and quality of delivery. The activities the project team has to define in order to support the project includes: technical investigation, scope, process investigation, social investigation, outline design, functional specification, quality specification, and all other important activities critical to project success. In the UK, project definition process is referred to as client briefing (Whelton, 2004). According to Mathur (2007), the briefing stage is the process of turning the client's desire for a built product into a clear brief for the project development team to implement. Early construction project planning in many cases is not performed well in the construction industry (Cho & Gibson Jr, 2001). Unfortunately, few client and contractor organizations who had tried to do this do a poor job of not adequately defining a project's scope leading to a poor design basis (Cho& Gibson Jr, 2001).

The strategic and tactical decisions made in the early stages of project development significantly influence the overall outcomes of the project development process, particularly as they determine the boundaries/scope of the project. Downstream project changes become increasingly difficult to incorporate into the development process without increased resource investment and rework.

In large multi-faceted organizations, ambiguity and uncertainty exist when attempting to realize the true purpose and expectations of project stakeholders, and it is difficult to distinguish real needs from wants or desires. Furthermore, stakeholders may not agree as a need for one may simply be a want for another. Therefore it is difficult for project managers to set shared priorities for the project. It is imperative that this project phase identifies what are the needs and wants of each stakeholder. Furthermore, it is necessary to define the differences and dependencies between the wants and needs of various stakeholders, so as to develop a shared understanding of the problem, and to subsequently develop alternative project solutions. The ability to share individual needs can allow project groups to have an increased awareness of each other's interests and this in turn can increase the likelihood that a common purpose can be developed.

RESEARCH METHODS

The research is based on a survey design. A non-probabilistic sampling technique 'purposive' was adopted in the selection of the sampled professionals from 28 consulting firms and 24 contracting firms within the research area. The rational for adopting this sampling technique was because of the unavailability of sample frame of consulting and contracting firms from which accurate sample size could be drawn. Fifty two professionals comprising architects, builders, civil/structural engineers, estate surveyors and quantity surveyors from the selected firms participated in the survey. The questionnaire used for the survey comprises three sections. The first Section contains general information about the respondents. These included (among other items) ownership status of respondents organisation, respondent profession, major field of operation, and work experience. The second section of the questionnaire contain items adopted from Project Definition Rating Index for Building Projects (PDRI-Buildings) developed by Cho and Gibson (2001). The respondents were asked to rate the degree of importance of seventy seven (77) variables, grouped into 11 major categories to project scope definition using a 5-point Likert scale. The third section, respondents were

asked to rate twenty challenges that negatively impact on effective project scope definition using a 5-point Likert scale. Descriptive and inferential statistics were used for the analysis.

RESULTS

Demographic data of respondents

Respondents from 28 contracting firms and 24 consulting firms within the construction industry participated in the study. In terms of ownership status, foreign firm constituted 5 (9.6%) of the sample, 73.1% were indigenous companies while 17.1% constituted both indigenous and foreign ownership. All the major professionals in the construction industry are included in the survey. The Architects constituted the majority with 23.1%, Civil/structural Engineers (19.2%), Quantity Surveyors (21.2%), Services (Electrical/Mechanical) Engineers (13.5%), Builders (17.3%), Estate Surveyors (3.8%), and the Facilities managers are the least with 1.9%. For the type of construction engage in, about 24 (46.5%) of the respondents engage in both building and civil works, 20(38.5%) engage in building works only, 2 (3.8%) engage in civil works only and 6 (11.5%) engage in Electrical/Mechanical services. More than half (76.9%) of the respondents have postgraduate diploma and above in terms of academic qualification and are all corporate members of their respective professionals associations. Twenty one percent of the respondents have been in the construction industry for less than five years. 42.3% have been in the industry for between six and 10 years. The remaining 36.5% have been in the industry for upward of 11years. About sixty-two percent of the respondents have executed more than five projects in the last five years. The inference drawn from the respondents profile is that information provided can be relied upon in view of their wide experience.

Importance of activities required for construction project definition

Table 1 shows descriptive statistics of respondents' perception of the degree of importance of activities required in construction project definition for effective project delivery. The respondents were asked to rate the degree of importance of a list of activities adopted from Project Definition Rating Index for Building Projects (PDRI-Building) based on a 5-Point Likert scale ranging from Extremely important to Not important. The results of the survey presented in Table 1 consist of seventy seven (77) variables grouped into 11 major categories. Under the business strategy category, type of development was ranked extremely important (mean = 4.52) and top the list of eleven variables. Project cost estimate (mean=4.95), project schedule (mean=4.71) and briefing by client (mean=4.62) were ranked extremely important out of seven variables under the project requirement category. Under site information category, government regulatory requirement (mean=4.71) ranked most important from a list of seven variables. Out of 13 variables listed under building programme category, building finishes (mean=4.86) ranked the most important. Preliminary budget estimate (mean=4.81), and safety (mean=4.62) top the list of 14 variables listed under building/project design parameters. Project organisation (mean=4.71) was ranked extremely important under project execution plan. Other variables listed under owner philosophies, equipment, procurement strategy, project control and deliverables were ranked low in order of importance. The standard deviation of all the variables ranked extremely important in the various categories are low (falls below +1 of the mean). This implies very close agreement in the respondent's perception of the importance of the variables for project definition.

Looking at professionals' perception of importance of variable for effective project scope definition, project cost estimate top the list. Improper cost estimate at the project definition stage can affect project cash flow which ultimately will affect project schedule overrun, cost overrun as well as quality. For Nigerian construction industry were the traditional procurement option is dominant, any reliable cost estimate must be preceded by detailed working drawings and construction programme. The current practice whereby contractors are mobilised to site with sketchy project details will only encourage corruption and consequently lead to project failure. This finding corroborate recent study by Fageha and Aibinu's (2014) in Saudi Arabia were project cost estimate top the list of 42 project scope definition elements based on pareto analysis. Project schedule which ranked second under project requirement in this study ranked 4th overall in the Saudi Arabia study. Similarly, governing regulatory requirement ranked 37th and safety 39th overall in the Saudi Arabia study.

Table 1: Importance of activities necessary to define a construction project

	VARIABLES	Overall Mean	Rank	Std. Deviation	Group Mean	Group Rank
A	**BUSINESS STRATEGY**				4.19	5
	Type of development	4.52	1	0.512		
	Building Use	4.38	2	0.498		
	Business Justification	4.30	3	0.463		
	Site Selection Considerations	4.28	4	0.453		
	Facility Requirements	4.24	5	0.436		
	Economic Analysis	4.24	5	0.768		
	Business Plan	4.19	7	0.680		
	Feasibility study	4.10	8	0.889		
	Duration	4.10	8	0.700		
	Project Objectives Statement	3.95	10	0.740		
	Future Expansion/Alteration Considerations	3.81	11	0.873		
B	**OWNER PHILOSOPHIES**				4.13	7
	Maintenance Philosophy	4.29	1	0.561		
	Reliability Philosophy	4.10	2	0.889		
	Design Philosophy	4.10	2	0.700		
	Operating Philosophy	4.05	4	0.669		
C	**PROJECT REQUIREMENTS**				4.37	2
	Project Cost Estimate	4.95	1	0.498		
	Project Schedule	4.71	2	0.902		
	Briefing by the client	4.62	3	0.218		
	Value-Analysis Process	4.48	4	0.512		
	Project Design Criteria	4.43	5	0.507		
	Evaluation of Existing Facilities	3.76	6	0.436		
	Scope of Work Overview	3.67	7	0.796		
D	**SITE INFORMATION**				4.29	3
	Governing Regulatory Requirements	4.71	1	0.463		
	Site Life Safety Considerations	4.38	2	0.740		
	Environmental Assessment	4.38	2	0.498		
	Civil/Geotechnical Information	4.24	4	0.539		
	Site Layout	4.14	5	0.573		
	Utility Sources with Supply Conditions	4.10	6	0.625		
	Site Surveys	4.05	7	0.669		
E	**BUILDING PROGRAMMING**				4.06	8
	Building Finishes	4.86	1	0.359		
	Building Summary Space List	4.29	2	0.784		
	Program Statement	4.19	3	0.680		
	Growth & Phased Development	4.19	3	0.602		
	Transportation Requirements	4.10	5	0.889		
	Room Data Sheets	4.05	6	0.921		
	Overall Adjacency Diagrams	4.05	6	0.740		
	Window Treatment	3.90	8	1.091		
	Functional Relationship Diagrams/Room by Room	3.90	8	0.768		
	Circulation and Open Space Requirements	3.86	10	0.727		
	Stacking Diagrams	3.86	10	0.573		
	Loading/Unloading/Storage Facilities Requirements	3.81	12	1.030		
	Furnishings, Equipment, & Built-ins	3.76	13	0.831		
F	**BUILDING/PROJECT DESIGN PARAMETERS**				4.40	1
	Preliminary budget estimate	4.81	1	0.402		
	Safety	4.62	2	0.498		
	Planning approvals	4.57	3	0.926		
	Quality control	4.57	3	0.746		
	Architectural Design	4.52	5	0.928		
	Electrical Design	4.48	6	0.750		
	Civil/Site Design	4.43	7	0.598		
	Constructability Analysis	4.38	8	0.740		
	Building Life Safety Requirements	4.33	9	0.658		
	Structural Design	4.24	10	0.889		
	Type of development	4.24	10	0.700		

	User definition	4.24	10	0.700		
	Mechanical Design	4.14	13	0.854		
	Technological Sophistication	4.05	14	1.024		
G	**EQUIPMENT**				4.00	9
	Equipment Location Drawings	4.24	1	0.831		
	Equipment List	3.90	2	0.700		
	Equipment Utility Requirements	3.86	3	0.793		
H	**PROCUREMENT STRATEGY**				3.79	10
	Cash flow forecast	4.38	1	1.024		
	Procurement Procedures and Plans	3.57	2	0.811		
	Identify Long Lead/Critical Equip. & Materials	3.43	3	0.926		
J	**DELIVERABLES**				3.43	11
	Documentation/Deliverables	3.48	1	1.224		
	CADD/Model Requirements	3.37	2	0.711		
K	**PROJECT CONTROL**				4.16	6
	Project Cost Control	4.57	1	0.811		
	Project Schedule Control	4.48	2	0.512		
	Project Quality Assurance and Control	4.43	3	0.870		
	Risk Management	4.24	4	0.539		
	Safety Procedures	4.05	5	0.805		
	CADD/Model Requirements	3.71	6	1.007		
	Documentation/Deliverables	3.67	7	0.658		
L	**PROJECT EXECUTION PLAN**				4.28	4
	Project Organization	4.71	1	0.717		
	Owner Approval Requirements	4.24	2	0.889		
	Project Delivery Method	4.24	2	0.944		
	Design/Construction Plan & Approach	4.10	4	1.136		
	Substantial Completion Requirement	4.10	4	0.944		

Challenges confronting construction professional in defining project scope.

The study sought to examine challenges that construction professional face in defining project scope. The respondents were asked to rate these challenges based on their experience using a 5-Point Likert scale ranging from Very High (5) to Very low (1). The frequency counts and the mean item score for each variable and the overall weighted average are computed, and summarized in Table 2. The result shows that lack of knowledge of project definition process top the list of challenges construction professionals face in defining project scope. This finding is not unconnected with designer's inadequate skills in construction technology and production management. Inadequate knowledge of the behaviour of construction materials, alternative method of achieving desired concepts among others will limit designers ability to foresee the scope of the proposed project. Initial problem represented by clients, insufficient time allocation to project definition, inadequate involvement of all the relevant parties and complexity of the process are among the top ranking challenges that construction professionals face in defining project scope.

Table 2: Challenges that project managers/construction professional face on effectively developing project definition

Challenges	Mean	Std. Deviation	Rank
No knowledge of project definition process	4.83	7.398	1
Initial problem represented by client	3.87	1.189	2
Insufficient time allocated to project definition	3.67	0.944	3
Inadequate involvement of all the relevant parties	3.60	1.272	4
Complexity of the process	3.56	1.11	5
Information Constraints	3.48	1.306	6
Poor process and organizational design	3.44	1.162	7
Discrepancies in documentation	3.42	1.405	8
Synergy problem	3.40	1.034	9
Inadequate consideration of the client perspectives	3.25	1.082	10
Inadequate management of changes in project requirements	3.13	1.284	11
inadequate communication between the parties	3.13	1.048	12
Number of Definition Stakeholder Groups	3.08	0.967	13
Inadequate briefing	3.00	1.066	14
Information exchange	2.88	1.215	15
high levels of uncertainty	2.83	1.279	16
Facilitator/coordinator problem	2.77	1.323	17
conflicting objectives	2.75	1.384	18
Project definition process not understood	2.69	1.365	19

No adequate communication	2.4	1.225	20

N=52 ;X^2 83.7464;Kendall's= 0.852; df=19;P= 0.00: 5=Very High; 4= High ; 3 = average ; 2 = Low; 1= Very Low

The result of Kendall and Chi-squares analysis shows that there is a consensus in the response of respondents regarding the challenges faced by the professionals in defining project scope.

CONCLUSIONS

Project cost estimate, project schedule, governing regulatory requirements, finishes top the list of items considered extremely necessary for project definition by professionals. These items inter alia serves as check list of important considerations for complete project definition to avert poor project performance. The absence of these items prior to project start up is believed to be among reasons for deficiencies, such as cost and time overruns, rework, poor work quality, high life cycle maintenance cost, as well as inadequate attention to safety, health and environmental issues prevalent in the Nigerian construction industry. Developing a rating index covering these item to ensure adequate completeness prior to project start-up will minimize deficiencies associated with project management, leading to client overall satisfaction. Challenges identified as constraints to complete project definition include lack of knowledge of project definition process by professionals, initial problem represented by clients, insufficient time allocation to project definition, inadequate involvement of all the relevant parties and complexity of the process. Appointment of a project manager early to oversee the activities of other professionals will ensure better coordination of the project development process.

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